

Generational Perspective of Higher Education Online Student Learning Styles

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Abstract

A study was conducted of students participating in on-line academic courses in institutions of higher education to ascertain if there was a generational influence on learning styles. The specific research question was: What, if any, relationships exist among learning styles, generational groups, and satisfaction with online learning? Inferential and descriptive statistics were used to determine there was a statistically significant differences between Baby Boomers and the Millennial Generation as well as Generation X. Baby Boomers were found to have significantly lower scores on this subscale as compared with both the Millennial Generation and Generation X. In addition, the Millennial Generation reported lower scores on overall satisfaction survey components as compared with both Generation Xers and Baby Boomers.

Keywords: higher education, online/distance learning, generational expectations and satisfaction

1. Introduction

Online education within institutions of higher education is experiencing a rapid and accelerating growth. By the end of 2005, students engaged exclusively as online students represented seven percent of post-secondary students within the United States (United States Distance Learning Association, 2007). The Sloan Foundation's *Staying the Course: Online Education in the United States 2008* reports that enrollment trends for fall of 2006 to fall of 2007 show an 11.3 percent increase over the preceding year. In 2007, over 3.9 million higher education students were enrolled in at least one online course. This number increased dramatically by 2011 to 6.7 million students representing 32 percent of higher education enrollment (Sheehy, 2013). In comparison the overall higher education student population experienced a 1.2 percent growth during this same time period (Allen & Seaman, 2008).

The student populations associated with online education as a whole are becoming more diverse in age, educational background, and cultural traits (Dabbagh & Bannan-Ritland, 2005). Each of these generational groups of students brings individual learning styles. Learning styles can be described as "a description of the attitudes and behaviors which determine an individual's preferred way of learning" (Honey & Mumford, 1992, p. 1). A variety of learning style models are found in the literature: Myers-Briggs Type Indicator (1956), Honey and Mumford (1992), Pask (1976), Kolb (1984), and Felder and Silverman (1988). While there are varying degrees of characteristics identified by these learning style models, all of the models are in agreement that a learner exhibits preferred preferences within which to learn. Cassidy (2004) stated that "Learning style was also found to correlate significantly with other academic performance-related factors such as academic self-efficacy and academic locus of control" (p. 439). Although there is disagreement about a direct correlation between student achievement and learning styles (Hannafin, Oliver, Hill, Glazer, & Sharma, 2003; Sandman, 2008), linkage to the student's satisfaction with an online education course has been established (Cassidy, 2004; Little, 2010; Verduin & Clark, 1991; Walker, 2003). According to Barnes, Preziosi, and Gooden (2004), "learning styles change from generation to generation requiring faster speed, a more visual approach and greater active engagement" (p. 21). Two commonly used learning style inventories that determine student learning styles in relationship to online education are the Kolb Learning Style Inventory and the Felder-Silverman Index of Learning Styles (ILS). Both are used to determine population distributions of student learning styles associated with student learning dispositions (Felder & Silverman, 1988; Felder & Solomon, 2011; Kolb, 1984; Richmond

& Cummings, 2005; Richmond & Liu, 2005; Thiele, 2003). Within the literature the Index of Learning Styles (ILS) initially created by Felder and Silverman (1988) was updated in 1991 by Felder and Solomon and is also referred to as the Felder and Solomon (2011) Index of Learning Styles (ILS).

1.1 Literature Review

Distance education, also known as e-learning, online education, or online learning is defined by the United States Distance Learning Association as “the acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies and other forms of learning at a distance” (USDLA, 2010, par. 3). Watson, Gemin, and Ryan (2008) explain “online learning” as “teacher-led education that takes place over the Internet, with the teacher and student separated geographically” (p. 5).

Within the literature, there is strongly documented research on the rapid increase in technology and its corresponding impact within business and the workplace (Benamati & Lederer, 2010; Francalanci & Morabito, 2008). This influx of technology into higher education has alternatively been less documented and has left many higher education administrators and faculty trying to understand the traditional role of higher education and implementation of technology on the instruction of their student populations (Calis, 2008; Cohen & Brower, 2008; Dabbagh & Bannan-Ritland, 2005; Duderstadt, 2003, 2007; Greer, 2010). According to Palloff and Pratt (2007), “The shift to online distance learning continues to pose enormous challenges to instructors and their institutions” (p. xv). These statements are echoed by Siemens and Conole (2011) who stated “Educators and researchers face a challenge in determining how the existing education system will be influenced and the new roles that will be expected of learners, teachers, and administrators” (p. i).

The United States Department of Education (2008) reported that “our education system must reflect the skills and knowledge essential to succeed in this new era” (p. 2). Online distance education, although initially costly and underused by some educators, is an important aspect of the educational facilities of tomorrow’s society (Cuban, 2001). This society will require enhanced and improved professional technologic development for educators as well as students in which to use these skills and information (Cuban, 2001; Duderstadt, 2003; Picciano, 2006).

Just over a decade ago, technology within schools was limited, and the wiring of schools for the integration of technology was just beginning. The use of computers, distance education, blogging, podcasting, and interactive technological communication has made its way into many of the United States’ educational institutions (Parsad & Jones, 2005). Escalating advancements in the placement of technology have also brought about its prevalence in our cars, homes, workplace, and social life but, at times, has been reluctantly accepted into the full realm of education (Simonson, Smaldino, Albright, & Zvacek, 2009; Wood & Matthew, 2005; Yelland, 2007).

This reluctant acceptance has been punctuated by rapid technological advancements, changes in demographics, and economic pressures that challenge higher education to redefine itself (Drucker, 1998; Duderstad, 2003, 2007; Cuban, 2001). Economist and management analyst Peter Drucker sounded an early alarm in 1997 by calling on higher educational administrations to examine and meet the new needs of “net-generation” (Oblinger, 2008; Tapscott, 2009) learners or become “Wastelands” (Lenzer & Johnson, 1997). As posited by Tapscott (2009),

With their reflexes tuned to speed and freedom, these empowered young people are beginning to transform every institution of modern life. From the work place to the market place, from politics to education to the basic unit of any society, the family, they are replacing a culture of control with a culture of enablement (p. 6).

According to Wiles and Lundt (2004), education can either take the road of working in a system that is afraid of change, or it can embrace change that is naturally frightening and further integrate technology into education. Academic leaders and faculty within higher education were surveyed by Allen and Seaman in 2005, 2007, 2008, and 2010 about their perceptions of faculty acceptance on the legitimacy and value of online education. The Allen and Seaman survey indicated over 75 percent of the academic leaders accepted the merits of online education, but only 33 percent of their faculty had a positive opinion about the delivery mode in 2006, changing slightly to 30 percent in 2010.

With the accelerated growth of online education in higher education, many higher education instructors are entering into the online virtual classroom for their first time. The transition from the traditional classroom to that of the virtual classroom has brought about some reluctance by faculty within higher education. Faculty reluctance is based on the idea that the most effective means to achieve student learning outcomes is through the use of traditional lecture (Blin & Munro, 2008). Faculty members within higher education have also reported other factors related to their resistance to online education by noting that faculty is concerned that their

traditional courses are not compatible with online education (Yang & Cornelius, 2005; Siemens & Conole, 2011).

Palloff and Pratt (2000) remind us that “technology does not teach students; effective teachers do” (p. 4). Christopher Wolf (2006) goes further by explaining that teaching online is teaching, and that the quick easy access that a student has to information is not a replacement for education. However, Crichton and Childs (2004) described how it is critical for educational leaders to view online teaching as a learned and nurtured practice because previous studies suggest that many early online faculty members were given online teaching assignments without training. This situation was coupled with their students lacking training on how to take online courses. Online instruction requires the use of different skill sets than are required to teach face-to-face. Both require planning and developing by the faculty member. However, according to Ko (2003), the planning and developing of asynchronous exercises must be completed before students enter the online course in comparison to integration of such exercises within the traditional classroom. The planning and design of the course according to Fassinger (1995) can have the greatest impact of all on student class participation. The transition of assignments, resources, texts, and course materials into the online environment can be challenging to the instructor along with learning how to communicate effectively in the online delivery medium (Ko, 2003; Moore, Winograd, Lange, & Moore, 2001; Muilenburg & Berge, 2005; Siemens & Conole, 2011; Sheard & Markham, 2005).

The concept of generational theory, which has been extensively advanced by Strauss and Howe (1991a) is that each generation is shaped by its own social environment. This social environment is a collection of social events experienced by individuals who share common birth years. These individuals develop commonly held beliefs and behaviors because of these social events (Strauss & Howe, 1991a, 1991b, 1997). From these commonly held beliefs and behaviors, the personality and description of that generational group is formed (Coomes & DeBard, 2004; Glenn, 2005; Strauss & Howe, 1991a).

The cohort, referring to a group of individuals, most often found in the review of literature associated with generational studies is that of the birth cohort describing individuals born during a given year, decade, or period of time (Glenn, 2005). Each of these cohorts is differentiated from all others as each new cohort acquires cohesion and continuity from the distinct developments of its constituents (Coates 2007; Coomes & DeBard, 2004; Glenn, 2005; Twenge, 2006). Distinction is made in the literature between age cohort and birth cohort with age being a changing condition rather than the birth cohort being a fixed year. According to Glenn (2005), these two cohort groups are distinctly different in that individuals born in 1980 are of a given birth cohort where the age of these individuals will be variable dependent upon when they are studied and, thus, make up the age cohort (Glenn, 2005). Strauss and Howe (1991a) describe a generation as a cohort of individuals whose length of time approximates the span of a life phase whose boundaries in time are fixed by peer personality. It is by these peer personalities that the generational characteristics are established.

Jane Twenge (2006) who has conducted research on the millennial generation, describes generational cohorts as:

Everyone belongs to a generation. Some people embrace it like a warm familiar blanket, while others prefer not to be lumped in with their age mates. Yet like it or not, when you were born dictates the culture you will experience. This includes the highs and lows of pop culture, as well as world events, social trends, economic realities, behavioral norms, and ways of seeing the world. The society that molds you when you are young stays with you the rest of your life. (p. 2)

Generational characteristics are described by Straus and Howe (1991a, 1997) as being comprised of such characteristics as political, economic, environmental, and social awakenings within a given time frame for an associated birth year group. They go on to explain that:

A generation can be defined as a society-wide peer group, born over a period roughly the same length as the passage from youth to adulthood, who collectively possess a common persona. The length need not be always the same. A generation can be a bit longer or shorter, depending on its coming-of-age experience and the vagaries of history. Of the nine American generations born over the past two centuries, none has been less than 17 years or longer than 24 years in length. When drawn correctly, generational birth years should indicate the boundaries for each generational persona. What is a generational persona? It is a distinctly human and variable creation embodying attitudes about family life, gender roles, institutions, politics, religion, culture, lifestyle, and the future. (Howe & Strauss, 2000, pp. 40-41)

Based on these categorical groupings, useful comparisons for characterizing behaviors can be made about the generational groups. According to Strauss and Howe (1991a), the living generational cohorts include the GI

Generation with birth years of 1901-1924, Silent Generation 1925-1942, Baby Boomer Generation 1943-1960, the Generation X sometimes referred to as the Thirteenth Generation 1961-1981, and the Millennial Generation 1982-2001. Howe and Strauss (2003) have used political, economic, and social events to identify generational groupings. Each of these events according to Howe and Strauss are described as awakenings lending towards the development of distinct generational characteristics and traits associated with groupings of individuals found in seventeen to twenty-four year periods.

Opposing viewpoints on generational research are limited in the literature. One such researcher is Peter Savich (2003) who argues in his examination of the social awakenings laid out by Howe and Strauss, that a flawed organizational framework is created. However, no supporting evidence to these claims made by Savich has been found in the literature. The given classification dates have also been argued as being arbitrary by researchers Meredith, Schewe, and Karlovich (2002) but are widely accepted in the literature that each of these generational cohorts exhibits its own unique set of characteristics that have been shaped by societal values, trends, and historical events (Strauss & Howe, 1991a; Howe & Strauss, 2000; Coomes & DeBard, 2004; Coates 2007; Glenn, 2005).

Research conducted by Cassidy (2004), Kolb and Kolb (2005) and Felder and Silverman (1988) demonstrate that increasing the understanding of the educational practitioner to the varied student population entering higher education provides for the establishment of stronger educational practices. The basis of this is the understanding that the students have been conditioned by their previous learning experiences in both educational as well as environmental settings. The student's ability to construct a developmental perspective of learning is a theory presented by Robert Kegan (1982; 1994) and expanded upon by Marcia Baxter Magolda (1999) to include the context of higher education. Their research can be summarized to suggest that a) "students construct knowledge by organizing and making meaning of their experiences," and b) "that this construction takes place in the context of their evolving assumptions about knowledge itself and the students' role in creating it" (Baxter Magolda, 1999, p. 6). It is through these "Self Authoring" (Kolb & Kolb, 2005, p. 209) experiences that each of these generational groups has distinctions from other generational groups. Generational self-authoring shapes and affects individual preferences within each generational group and creates an importance for educators to understand not only what a student understands, but also how he or she understands (Heller & d'Ambrosio, 2009; Kegan, 1994; Kolb & Kolb, 2005).

According to Levine and Dean (2012),

... September 11 was not the key event in their lives. Rather, it was the establishment of the World Wide Web. The Internet has affected seemingly every aspect of college life from the classroom and personal relationships to student politics and entertainment. We are convinced that the changes we are witnessing today are only the beginning of a cascade that will follow, touching not only current undergraduates but also transforming the world of their successors: The colleges, universities, and institutions and the people who surround them. (p. 3)

2. Research Method

This research addressed the following research question:

What, if any, relationships exist among learning styles, generational groups, and satisfaction with online learning?

This correlational research study sought to determine to what degree a relationship exists between two or more variables. It is important to note that establishing a correlation between variables does not define the causal factors. Correlational research attempts to determine whether and to what degree a relationship exists between two or more quantifiable numerical variables (Creswell, 2003; Cozby, 2007; Gay & Airasian, 1999). A correlation design was selected for this study in order to quantify a relationship between learning styles and that of generational-age cohorts found within higher education distance education courses. The learning styles associated with the individuals found in each of the three age-cohort generational groups was assessed using Felder and Solomon's Index of Learning Style (ILS) instrument.

The independent variables include each respondent's reported generational demographics. These groups consist of students from the Baby Boomers 1943-1960, Generation X 1961-1981, and the Millennial Generation 1982-2001 (Strauss & Howe, 1991a). Additionally, independent variables associated with student learning styles were identified through the use of the Felder and Solomon Index of Learning Style instrument originally developed by Felder and Silverman in 1988. The independent variables identified in this research include the

four learning styles as described in the ILS and include: (a) active and reflective; (b) sensing and intuitive; (c) visual and verbal; and (d) the sequential and global dimensions.

Dependent variables identified within the study include student satisfaction scores reported through the use of the Distance Education Learning Environment Survey (DELES) Instrument. The satisfaction scores were measured and identified for each respondent by taking the mean of the eight items found on the DELES instrument. Student satisfaction as reported through the use of the survey instrument was the dependent variable of this study and has been established by the Sloan Consortium as one of the five pillars of quality online education (Sloan-C, 2002).

To address the research questions for this study, data was analyzed using descriptive statistics, Chi-square analysis, and the analysis of variance (ANOVA). Descriptive statistics were used to describe the participants. Gall, Gall, and Borg (2007) explain that the use of a Chi-square test is “a nonparametric test of statistical significance that is used when the research data are in a form of frequency counts for two or more categories” (p. 634). Gall, Gall, and Borg (2007) also defined descriptive statistics as “mathematical techniques for organizing, summarizing, and displaying a set of numerical data” (p. 638). Using descriptive statistics will allow the sample characteristics to be described through the use of standard deviation, means, and frequency (Salkind, 2000).

A one-way analysis of variance (ANOVA) was conducted to examine student attitudes associated with the use of their learning styles in the online education environment. Analysis of participants generational placement on the learning style dimensions described by Felder and Soloman was analyzed statistically using an ANOVA value with an alpha = .05 to determine differences among generations. Gall, Gall, and Borg (2007) described an ANOVA as “a procedure for determining whether the difference between the mean scores of two or more groups on a dependent variable is statistically significant” (p. 632). The use of an ANOVA is further described by Nicol and Pexman (1999) by stating that it “is used when there is one independent variable and one dependent variable and is used to assess the differences between two or more group means” (p. 15). Following the analysis of variance (ANOVA) calculations being conducted, a Scheffe post-hoc comparison analysis test was used to determine the variable grouping differences.

The use of a multiple linear regression analysis method was chosen in order to examine the data collected from the DELES survey instrument. Through the use of the linear analysis, the relationships between the dependent variable, the student and the six DELES predictor variables: (a) instructor support, (b) student interaction and collaboration, (c) authentic learning, (d) personal relevance, (e) active learning, and (f) student autonomy were analyzed. The use of the linear regression analysis establishes a linear equation to predict the value of the dependent variable, based on the established value of the predictor (Mertler & Vannata, 2002). According to Tabachnick and Fidell (2007), multiple regression enables the researcher to evaluate the “relationship between one [dependent variable] and several [independent variables]” (p. 117). The rationale for using multiple linear regression was that the researcher had only one dependent variable of the student satisfaction scores, and 11 independent variables (Field, 2005; Tabachnick & Fidell, 2007). The gathered variables were standardized in order to make the beta weights comparable to each other. To standardize the variables, the researcher converted the mean scores into a *z*-score, which created a mean of zero and a standard deviation of 1 (Field, 2005).

Chi-square tests for independence were used to measure demographic variables of gender, race/ethnicity, and differences in preferred learning style distributions among and between the generational cohort groupings. The Chi-square test is further described by Nicol and Pexman (1999) as a means to determine “whether differences between observed and expected frequencies are statistically significant” (p. 43).

2.1 Validity and Reliability

Tests performed on the reliability of the Index of Learning Styles using a Cronbach’s alpha by Cook (2005), support the instrument’s internal consistency. In the study conducted by Cook, the Cronbach’s alpha and test-retest correlation for ILS scores were 0.61 and 0.75 (active-reflective dimension), 0.78 and 0.81 (sensing-intuitive), 0.70 and 0.60 (visual-verbal), and 0.67 and 0.81 (sequential-global).

Felder and Spurlin in an examination of the ILS further addressed the reliability and validity of the instrument by establishing estimates of reliability score from 0.56 to 0.77 (Felder & Spurlin, 2005). The work of Livesay, Dee, Felder, Hites, Nauman, and O’Neal (2002) examined the responses of 584 learners from North Carolina State University and recorded a Cronbach’s alpha coefficients to be in the range of 0.55 to 0.76. Based on this previous research and support of the Felder and Soloman Index of Learning Styles, it is viewed as an appropriate instrument for use in this dissertation study.

Although the DELES instrument is a relatively new survey instrument, its use has been examined through extensive validity and reliability evaluations. In the review of literature, the DELES is described as a “validated instrument for post-secondary distance education” (Biggs, 2006, p. 46). A Cronbach’s alpha was used to evaluate the internal consistency of the DELES instrument. Walker (2003) and Walker and Fraser (2005) report Cronbach alpha coefficients of each scale as being the following: Instructor support, .89; Active learning, .75; Student autonomy, .79, and Student satisfaction, .79. Based on the provided Cronbach alpha scores being close to an alpha rating of .80, they are considered good to excellent reliability indicators (Field, 2005; Gliem & Gliem, 2003; Walker, 2003; Walker & Fraser, 2005).

Based on the fact that the Distance Education Learning Environment Survey uses a Likert-type scale, Gliem and Gliem (2003) provide support for the reliability of the instrument by stating:

When using Likert-type scales [sic] it is imperative to calculate and report Cronbach’s alpha coefficient for internal consistency reliability for any scales or subscales one may be using. The analysis of the data then must use these summated scales or subscales and not individual items. If one does otherwise, the reliability of the items is at best probably low and at worst unknown. Cronbach’s alpha does not provide reliability estimates for single items. (p. 88)

According to Walker and Fraser (2005, p. 1) “each learning environment item has a factor loading of at least 0.50 with its own scale,[sic] and less than 0.50 with all other scales. The alpha reliability coefficient for each scale ranged from 0.75 to 0.94.” Factor analysis is used in the DELES to identify and describe patterns of co-relationship between variables or the identified scales. A further explanation of this is that items or questions found within the salient scale of active learning would require having a factor loading of 0.50 in order to be included in that scale. Items with less than a 0.50 factor loading would be considered “flawed” and not be included in that scale. The factor analysis according to Walker and Fraser (2005) and substantiated through a study conducted by Sahin (2008) allows the researcher to evaluate whether an item in a given scale measures only that scale, further validating the validity and reliability of the DELES instrument.

2.2 Demographics of Participants

Demographic characteristics of the population consisted of gender, generational birth year grouping, number of online education classes taken, ethnicity, level of educational study, and reported overall grade point average. Frequency tables were constructed for categorical variables of interest. The data provided in Table 1 focuses upon respondent gender. As shown, slightly over 75% of respondents in the sample were female, with slightly under 25% being male. Students under 18 years old were directed to the end of the survey.

Table 1. Descriptive statistics: Gender

Category	N	%	Valid %	Cum. %
Female	1093	75.3	76.6	76.6
Male	333	22.9	23.4	100.0
Total	1426	98.3	100.0	
Under 18 yrs. Old	25	1.7		
Total	1451	100.0		

Table 2 summarizes the population with regard to birth year or generational status. As indicated, slightly over 50% were millennial generation members, slightly over one third were members of Generation X, and close to 15% were Baby Boomers. The break down by gender and generational grouping (Table 7) included a total of 717 respondents being identified in the Millennial grouping with 558 (77.8%) females and 159 (22.2%) males. Generation X respondents comprised a group of 393 (75.7%) females and 126 (24.3%) males. The remaining response group consisted of the Baby Boomers with 142 (74.7%) females and 48 (25.3%) males. Additionally, a chi-square analysis was conducted in order to determine whether there were statistically significant associations between generational status and gender. The chi-square analysis conducted between generational status and gender was not found to achieve statistical significance, $\chi^2(2) = 1.190, p = .551$.

Table 2. Descriptive statistics: Birth year

Category	N	%	Valid %	Cum. %
Millennial	717	49.4	50.3	50.3
Generation X	519	35.8	36.4	86.7
Baby Boomers	190	13.1	13.3	100.0
Total	1426	98.3	100.0	
Under 18 yrs. old	25	1.7		
Total	1451	100.0		

Examination of respondents' ethnicity is summarized in Table 3. Nearly 90% of the sample consisted of Caucasian respondents, with all other races combined constituting approximately 10% of the sample.

Table 3. Descriptive statistics: Ethnicity

Category	N	%	Valid %	Cum. %
Other	20	1.4	1.4	1.4
Native American	46	3.2	3.2	4.6
Asian	20	1.4	1.4	6
Black	13	0.9	0.9	6.9
Hispanic	46	3.2	3.2	10.2
Caucasian	1281	88.3	89.8	100.0
Total	1426	98.3	100.0	
Under 18 yrs. old	25	1.7		
Total	1451	100.0		

The student level of educational study was examined by classifying these levels into certificate program, associate degree, bachelor degree, master degree and doctoral degree programs. By percentage the largest of these educational groups was represented by the Millennial Generation with a bachelor educational level of study consisting of 406 (56.6%) students with a total of 717 millennial students. Generation X students reported being enrolled in master degree programs 202 (28.9%) with a total of 519 students, and Baby Boomers pursuing master degree 67 (35.3%) with a total of 190 students. Generational grouping to level of educational study is described in Table 4.

Table 4. Distribution of generational students based on level of educational study

	Certificate Program	Associate Program	Bachelor Program	Master Program	Doctoral Program	Total
Millennial	29	187	406	88	7	717
% generational group	4.0%	26.1%	56.6%	12.3%	1.0%	100.0%
% of Education level	46.8%	49.0%	60.0%	31.0%	26.9%	50.3%
Generation X	25	154	202	129	9	519
% generational group	4.8%	29.7%	38.9%	24.9%	1.7%	100.0%
% of Education level	40.3%	40.3%	30.1%	45.4%	34.6%	36.4%
Baby Boomer	8	41	64	67	10	190
% generational group	4.2%	21.6%	33.7%	35.3%	5.3%	100.0%
% of Education level	12.9%	10.7%	9.5%	23.6%	38.5%	13.3%
Total program count	62	382	672	284	26	1426
	4.3%	26.8%	47.1%	19.9%	1.8%	100.0%

Table 5 summarizes the population with regard to birth year or generational status. As indicated, slightly over 50% were Millennial Generation members, slightly over one third were members of Generation X, and close to 15% were Baby Boomers. The break down by gender and generational grouping (Table 1) included a total of 717 respondents being identified in the Millennial grouping with 558 (77.8%) females and 159 (22.2%) males. Generation X respondents comprised a group of 393 (75.7%) females and 126 (24.3%) males. The remaining response group consisted of the Baby Boomers with 142 (74.7%) females and 48 (25.3%) males. Additionally, a Chi-square analysis was conducted in order to determine whether there were statistically significant associations between generational status and gender. The Chi-square analysis conducted between generational status and gender was not found to achieve statistical significance, $\chi^2(2) = 1.190, p = .551$.

Table 5. Descriptive statistics: Birth year

Category	N	%	Valid %	Cum. %
Millennial	717	49.4	50.3	50.3
Generation X	519	35.8	36.4	86.7
Baby Boomers	190	13.1	13.3	100.0
Total	1426	98.3	100.0	
Under 18 yrs. old	25	1.7		
Total	1451	100.0		

Descriptive statistics associated with the generational subsets Millennial, Generation X, and Baby Boomer related to the ILS survey instrument learning styles (a) active (ACT) and reflective (REF); (b) sensing (SEN) and intuitive (INT); (c) visual (VIS) and verbal (VRB); and (d) the sequential (SEQ) and global (GLO) dimensions are presented. Table 2 presents descriptive statistics associated with these measures based on the ILS subscale. Some differences were found in mean scores for these items based upon generation grouping.

Table 6. Descriptive statistics: ILS subscales

Measure	n	Mean	Std. Dev.	Std. Err.	95% C.I.		Min.	Max.
					Upper	Lower		
<u>Active-Reflective (ACT - REF)</u>								
Millennial	717	5.84	1.888	0.071	5.7	5.98	0	11
Generation X	519	5.83	1.858	0.082	5.67	5.99	1	11
Baby Boomers	190	5.97	2.120	0.154	5.66	6.27	0	11
Total	1426	5.85	1.909	0.051	5.75	5.95	0	11
<u>Sensing-Intuitive (SEN - INT)</u>								
Millennial	717	5.77	1.893	0.071	5.63	5.90	0	11
Generation X	519	5.68	1.951	0.086	5.51	5.85	1	11
Baby Boomers	190	5.56	2.378	0.173	5.22	5.90	0	11
Total	1426	5.71	1.985	0.053	5.60	5.81	0	11
<u>Visual-Verbal (VIS - VRB)</u>								
Millennial	717	7.13	2.239	0.084	6.96	7.29	0	11
Generation X	519	7.02	2.325	0.102	6.82	7.22	0	11
Baby Boomers	190	6.32	2.481	0.180	5.96	6.67	0	11
Total	1426	6.98	2.317	0.061	6.86	7.10	0	11
<u>Sequential-Global (SEQ - GLO)</u>								
Millennial	717	6.44	2.174	0.081	6.28	6.60	1	11
Generation X	519	6.44	2.206	0.097	6.25	6.63	0	11
Baby Boomers	190	6.34	2.233	0.162	6.02	6.66	0	11
Total	1426	6.43	2.192	0.058	6.31	6.54	0	11

The values of the active-reflective (ACT-REF) learning style subscale were obtained from the eleven forced-choice items, with each option corresponding to one or another category of the dimension (e.g., active or reflective). These values were averaged to produce an overall mean for each generational cohort group. Using the first ACT-REF grouping, a value of 0 or 1 represents a strong preference towards active learning, a 2 or 3 a moderate preference for active learning, a 4 or 5 a mild preference toward active learning, a 6 or 7 a mild preference towards reflective learning, an 8 or 9 a moderate preference for reflective learning, and 10 or 11 a strong preference for reflective learning. This method of analysis was used for all statistics associated with the ILS learning style subsets.

ACT-REF was the first ILS domain examined. In this analysis, the Baby Boomer Generation ($M = 5.97$) and standard deviation ($SD = 2.1$, $N = 190$) indicated a slightly increased preference toward reflective learning in comparison to the Millennial Generation ($M = 5.84$) and Generation X ($M = 5.83$).

Sensing – Intuitive (SEN-INT) was the second ILS domain examined. In this analysis, the Millennial Generation ($M = 5.77$) and the standard deviation ($SD = 1.89$, $N = 717$) indicated a slightly increased preference toward intuitive learning over Generation X ($M = 5.68$) and Baby Boomers ($M = 5.56$).

The third ILS domain examined was that of Visual – Verbal (VIS-VRB). In this analysis, Baby Boomers ($M = 6.32$) and standard deviation ($SD = 2.48$, $N = 190$) indicated a mild preference toward verbal learning in comparison to Generation X ($M = 7.02$) and Millennial ($M = 7.13$) with a mild preference toward visual learning. A statistically significant difference was also found and noted within this learning style preference.

The fourth ILS domain examined was Sequential – Global (SEQ-GLO). In this analysis, SEQ-GLO displayed strikingly similar preferences. Millennial Generation ($M = 6.44$) and Generation X ($M = 6.44$) indicated the same mild preference toward global learning. Baby Boomer Generation results ($M = 6.34$) indicated a slightly less mild preference towards global learning.

ANOVA results are indicated in the following table. As shown, statistically significant differences on the basis of generation were only found with regard to the Visual-Verbal subscale

Table 7. Results of ANOVAs on ILS subscales

Measure	S.S	df	M.S.	F	Sig.
<u>Active-Reflective (ACT - REF)</u>					
Between Groups	2.924	2	1.462	0.4	0.67
Within Groups	5191.445	1423	3.648		
Total	5194.368	1425			
<u>Sensing-Intuitive (SEN - INT)</u>					
Between Groups	7.068	2	3.534	0.9	0.41
Within Groups	5606.405	1423	3.940		
Total	5613.473	1425			
<u>Visual-Verbal (VIS - VRB)</u>					
Between Groups	100.022	2	50.011	9.42	0.00
Within Groups	7553.347	1423	5.308		
Total	7653.369	1425			
<u>Sequential-Global (SEQ - GLO)</u>					
Between Groups	1.818	2	0.909	0.19	0.83
Within Groups	6845.243	1423	4.810		
Total	6847.06	1425			

Scheffe post hoc results associated with each of the four ANOVAs performed on the measures relating to Index of Learning Style are presented in Table 8. Only the analysis conducted on the Visual-Verbal scale was found to achieve significance. The * found in Table 7 represents the probability that the mean difference is significantly

different from zero and is below .05. Essentially, this indicates that the possibility that there is a true difference between the mean scores is statistically significant at the .05 probability level. Within these multiple comparison tests, statistical significance was only achieved in the post hoc analyses conducted on the Visual-Verbal scale. Within this analysis, Baby Boomers were found to have significantly lower scores on the Visual-Verbal scale as compared with both individuals of the Millennial generation as well as Generation X respondents. No other statistically significant results were found within this set of analyses.

Table 8. Scheffe post hoc comparisons: Index of learning style measures

		95% C.I.					
		Comparison Group	Mean Dif	Std. Error	Sig.	Lower	Upper
Measure of Active-Reflective							
Millennial	Generation X	0.009	0.11	0.997	-0.26	0.28	
	Baby Boomers	-0.129	0.156	0.711	-0.51	0.25	
Generation X	Millennial	-0.009	0.11	0.997	-0.28	0.26	
	Baby Boomers	-0.138	0.162	0.696	-0.53	0.26	
Baby Boomers	Millennial	0.129	0.156	0.711	-0.25	0.51	
	Generation X	0.138	0.162	0.696	-0.26	0.53	
Measure of Sensing-Intuitive							
Millennial	Generation X	0.086	0.114	0.756	-0.19	0.37	
	Baby Boomers	0.208	0.162	0.439	-0.19	0.6	
Generation X	Millennial	-0.086	0.114	0.756	-0.37	0.19	
	Baby Boomers	0.122	0.168	0.768	-0.29	0.53	
Baby Boomers	Millennial	-0.208	0.162	0.439	-0.6	0.19	
	Generation X	-0.122	0.168	0.768	-0.53	0.29	
Measure of Visual-Verbal							
Millennial	Generation X	0.11	0.133	0.711	-0.22	0.43	
	Baby Boomers	.811*	0.188	0	0.35	1.27	
Generation X	Millennial	-0.11	0.133	0.711	-0.43	0.22	
	Baby Boomers	.702*	0.195	0.002	0.22	1.18	
Baby Boomers	Millennial	-.811*	0.188	0	-1.27	-0.35	
	Generation X	-.702*	0.195	0.002	-1.18	-0.22	
Measure of Sequential-Global							
Millennial	Generation X	0.004	0.126	0.999	-0.31	0.31	
	Baby Boomers	0.107	0.179	0.837	-0.33	0.55	
Generation X	Millennial	-0.004	0.126	0.999	-0.31	0.31	
	Baby Boomers	0.102	0.186	0.859	-0.35	0.56	
Baby Boomers	Millennial	-0.107	0.179	0.837	-0.55	0.33	
	Generation X	-0.102	0.186	0.859	-0.56	0.35	

Notes: *p<.05.

A Chi-square test was conducted to address the research question associated with the relationship between the participants' identified generational group and associated learning style dimensions as identified by the ILS. Tables 9 through 12 provide the detailed generational Chi-square test analysis associated within each ILS dimension conducted.

Table 9. Chi-square (χ^2) and analysis of variance for ILS dimensional scale ACT-REF

ACT - REF ILS Dimension	Millennial	Generation X	Baby Boomer
11a-ACT	1.80	0.94	17.72
9a-ACT	0.15	0.08	0.08
7a-ACT	0.02	0.30	0.36
5a-ACT	0.10	0.32	0.10
3a-ACT	2.03	1.62	0.44
1a-ACT	0.56	0.53	0.06
1b-REF	0.02	0.01	0.02
3b-REF	0.22	0.84	0.38
5b-REF	0.84	0.70	0.16
7b-REF	0.23	0.72	0.22
9b-REF	0.25	0.23	0.03
11b-REF	0.10	1.82	8.17
Sum	p-value	df	
42.2	0.0017	22	
Conclusion:	Statistically Significant Difference p<0.05		

Table 10. Chi-square (χ^2) and analysis of variance for ILS dimensional scale SEN-INT

SEN - INT ILS Dimension	Millennial	Generation X	Baby Boomer
11a-SEN	1.81	0.12	17.72
9a-SEN	5.56	0.76	0.45
7a-SEN	10.16	3.14	3.98
5a-SEN	0.58	0.70	2.52
3a-SEN	1.25	2.83	0.70
1a-SEN	0.00	2.42	3.81
1b-INT	0.06	1.48	0.10
3b-INT	0.61	0.45	0.17
5b-INT	1.11	7.68	2.53
7b-INT	3.25	1.25	6.95
9b-INT	1.48	0.23	0.24
11b-INT	0.91	1.82	28.17
Sum	p-value	df	
42.2	0.0017	22	
Conclusion:	Statistically Significant Difference p<0.05		

Table 11. Chi-square (χ^2) and analysis of variance for ILS dimensional scale VIS-VRB

VIS - VRB ILS Dimension	Millennial	Generation X	Baby Boomer
11a-VIS	184.30	133.53	10.08
9a-VIS	249.74	183.64	7.13
7a-VIS	134.62	95.42	26.26
5a-VIS	34.25	9.71	3.98
3a-VIS	1.90	0.43	0.44
1a-VIS	20.91	14.76	5.13
1b-VRB	40.03	30.40	5.05
3b-VRB	16.42	7.76	7.04
5b-VRB	6.77	4.16	1.71
7b-VRB	0.51	0.05	3.05
9b-VRB	1.48	0.23	0.03
11b-VRB	0.91	0.02	16.67
Sum	p-value	df	
42.2	0.0017	22	
Conclusion:	Statistically Significant Difference p<0.05		

Table 12. Chi-square (χ^2) and analysis of variance for ILS dimensional scale SEQ-GLO

SEQ - GLB ILS Dimension	Millennial	Generation X	Baby Boomer
11a-SEQ	1.80	0.94	17.72
9a-SEQ	0.15	0.08	0.08
7a-SEQ	0.02	0.30	0.36
5a-SEQ	0.10	0.32	0.10
3a-SEQ	2.03	1.62	0.44
1a-SEQ	0.56	0.53	0.06
1b-GLO	0.02	0.01	0.02
3b-GLO	0.22	0.84	0.38
5b-GLO	0.84	0.70	0.16
7b-GLO	0.23	0.72	0.22
9b-GLO	0.25	0.23	0.03
11b-GLO	0.10	1.82	8.17
Sum	p-value	df	
42.2	0.0017	22	
Conclusion:	Statistically Significant Difference p<0.05		

3. Results

The first null hypothesis addressed by the analyses of collected data in this study was:

$H1_0$) There is no difference in perceived learning style based on Felder and Solomon ILS in online courses reported among Baby Boomer, Generation X, and Millennial Generation students.

The results of the study indicated a relationship between generational groups with a difference between groups towards the Visual-Verbal learning style indicator. Statistically significant differences were found between Baby Boomers and the Millennial Generation as well as Generation X. Baby Boomers were found to have significantly lower scores on this subscale as compared with both the Millennial Generation and Generation X. The null hypothesis is rejected because statistically significant differences were found to exist between the generational groups regarding the Visual – Verbal learning style indicator. No other statistically significant differences related to preference for one learning style over another learning style was determined between generational groups.

The second null hypothesis stated:

H2₀) There is no difference in overall satisfaction in online courses reported among Baby Boomer, Generation X, and Millennial Generation students.

In view of the current status of generational differences and learning satisfaction research, this study found that there were significant mean difference score comparisons among the Millennial generation, Generation X, and Baby Boomers. Specifically, the Millennial Generation reported lower scores on overall satisfaction survey components as compared with both Generation Xers and Baby Boomers.

Further, when evaluating the generational groups based on the predictors of student autonomy and interaction, these two predictors were found to have a statistically significant, positive impact on student satisfaction. The findings indicate that student autonomy and interaction was found to be most important among Baby Boomers and had approximately half the impact among Generation X and Millennial respondents. Based on these findings, a relationship exists between students' generational groupings and satisfaction with their online education course as measured by the DELES instrument. Therefore, the second null hypothesis was rejected.

This study indicated the need for development of improvement in online education cognizant of differing needs within different generations of students. In each generational group, many participants reported mild preferences on one side or the other of each learning style preference. The one exception was visual-verbal. In this learning style preference, the Baby Boomer population was more heavily tilted toward verbal preference. In this study there were substantially more moderate preferences on one side of the dimension than on the other, and those imbalances are interesting and have important implications for teaching. However, they are generally not enough to make a great difference in the categorization of a group's preference.

Diaz and Cartnal (1999) wrote: "One of the first things we teachers can do to aid the learning process is simply to be aware that there are diverse learning styles in the student population" (p. 130). A growing body of evidence indicates that generational groups exhibit different learning and satisfaction characteristics. This evaluation of students is tied directly to the seven principles for good practice in education as outlined by Chickering and Gamson (1997). These practices encourage: (a) contact between students and faculty (b) active learning; (c) increased cooperation between students; (d) providing prompt feedback; (e) communication of high expectations; (f) emphasis upon time on task; and (g) respect for diverse ways of learning and talents. It is within this new context that faculty and institutions may find it valuable to ask how well they know and understand their student population. How these student populations are addressed will almost undoubtedly affect how student populations are retained.

Each of the generational cohort groups presented a mixture of learning and satisfaction preferences. When looking at correlations between student autonomy, interaction and student satisfaction, all generational groups were found to exhibit positive statistically significant relationships. Educators as well as school administrators have expressed agreement that individual differences and the changing demographical characteristics of learners play an important role in learning. This understanding, then, supports awareness in the adoption and implementation of technologies and instructional practices (Christensen, Johnson, & Horn, 2010; Dede, 2006; Felder & Silverman, 1988; Knowles, 1980).

4. Implications

With online education continuing to grow within higher education, there is continued need to critically examine and meet student needs. Although the literature supports conclusions that distance students achieve equivalent learning outcomes to those in the traditional face-to-face classroom barriers still exist. Existing barriers identified in the work of Muilenburg and Berge (2005) include feelings of isolation and lack of social interaction by students. Statements made by Peter Drucker in 1995 about higher education campuses needing to address instructional delivery methodologies and change or become relics of the past (Lenzer & Johnson, 1997) are now echoed in Clayton M. Christensen and Henry J. Eyring's book *The Innovative University*. In looking at the delivery of education through Christiansen's *theory of disruptive innovation*, university systems must continue to

reevaluate delivery and instructional methodologies that they use in order to prepare students for the workplace. If university systems are not preparing, they will give way to institutions with more innovative educational models.

This study indicated the need for development of improvement in online education cognizant of differing needs within different generations of students. In each generational group, many participants reported mild preferences on one side or the other of each learning style preference. The one exception was visual-verbal. In this learning style preference, the Baby Boomer population was more heavily tilted toward verbal preference. In this study, there were substantially more moderate preferences on one side of the dimension than on the other, and those imbalances are interesting and have important implications for teaching. However, they are generally not enough to make a great difference in the categorization of a group's preference.

It is not enough to develop an awareness of student learning styles, and the associated learning style preference of a student population by the instructor. This understanding must translate into evolving learning and instructional strategies, respectively. A major reason for learning style awareness is the need for instructors, and course developers to broaden their understanding of learner preferences in order to be more effective in creating stimulating learning environments. Additional research is needed in order to design and structure online learning environments based on those styles. Introducing online technology alone is not a solution. The large educational gain associated with these diverse generational groups comes when new technologies are combined with new ways of teaching. It is believed that through an increased understanding, the design and implementation will improve the satisfaction and quality of online education learning experiences for generations to come.

With increased diversity in online learning management systems (LMS) delivering online courses, the examination of course elements and technology related to these groups should be examined. This examination could include designing objectively similar courses to be implemented on different learning management system platforms to see if an effect on satisfaction and learning style is found. A further investigation associated with technology is to use instructional design practices that design two parallel courses with differing learning styles in mind in order to study student satisfaction and retention rates.

Thiele (2003) has noted the importance of identifying student learning styles and adapting online course design to accommodate these styles. Future research could be conducted to examine if providing students with an awareness of their own learning style preference would affect their satisfaction with online education courses. This proposed study then could be followed by examining this increased satisfaction and if this increased satisfaction resulted in higher retention and grades for the course compared to a control group that was not informed of its learning style preferences.

A similar study is recommended to examine if instructor awareness of learning style research may affect an instructor's ability to design and teach an online course. Pallaff and Pratt (2007) explain that in order to increase student satisfaction, instructors and universities need to focus on the learning community within the online course. Would this increased ability to design a course towards learning styles increase student satisfaction within the course?

Another recommendation for future research would be to examine instructor training in relationship to teaching an online course. Results of this study indicate that instructor support had a statistically significant, positive impact upon student satisfaction. As online learning continues to progress in student numbers and offerings, instructors will most likely be held to a higher standard of excellence, driving increased demand for tech-savvy instructors. What is not known is how the direct impact of instructor training on a learning management system relates to identified student satisfaction of a course.

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